

WHAT IS CLAIMED IS:

1 1. A method of repairing a valve in a patient's body, the valve having a
2 plurality of movable leaflets, the leaflets having a superior surface on a first side and an
3 inferior surface on an opposing side, the method comprising:
4 positioning a coapting device near the valve, the coapting device having a pair
5 of movable arms,
6 engaging the inferior surfaces of the leaflets with the arms;
7 manipulating the arms to hold the leaflets in a coapted position in
8 which at least portions of the superior surfaces face each other; and
9 implanting the coapting device in the patient's heart to maintain the
10 leaflets in the coapted position.

1 2. The method of claim 1 further comprising engaging the superior
2 surfaces of the leaflets before moving the arms to the closed position.

1 3. The method of claim 2 wherein the superior surfaces of the leaflets are
2 each engaged by a superior element movably coupled to the coapting device.

1 4. The method of claim 3 wherein the leaflets are pinched between the
2 superior elements and the arms.

1 5. The method of claim 3 wherein the superior element is removed from
2 the leaflets prior to implanting in the patient's heart.

1 6. The method of claim 1 wherein the arms are disposed in a delivery
2 position during positioning of the coapting device near the valve, and further comprising
3 spreading the arms from the delivery position to the open position after the positioning step.

1 7. The method of claim 1 wherein the coapting device is releasably
2 coupled to a flexible shaft adapted for positioning through a blood vessel, and wherein the
3 coapting device is implanted by releasing the coapting device from the flexible shaft.

1 8. The method of claim 7 wherein the flexible shaft is slidably positioned
2 through a sheath disposed in the blood vessel.

1 9. The method of claim 1 wherein the leaflets are not penetrated by the
2 arms.

1 10. The method of claim 1 wherein the valve is in the patient's heart.

1 11. The method of claim 10 wherein the valve is the mitral valve.

1 12. The method of claim 11 wherein the positioning the coapting device
2 comprises introducing the coapting device through the interatrial septum into the left atrium.

1 13. Apparatus for repairing a valve in a patient's body, the valve having a
2 plurality of movable leaflets, the leaflets having a superior surface on a first side and an
3 inferior surface on an opposing side, the apparatus comprising:

4 a pair of arms coupled together and movable from an open position in which
5 portions of the arms are spaced apart to a closed position in which the portions of the arms
6 are closer together, the arms being configured to engage the inferior surfaces of the leaflets
7 and hold the leaflets in a coapted configuration in which portions of the superior surfaces are
8 facing each other;

9 wherein the arms are implantable in the patient's body to maintain the leaflets
10 in the coapted configuration.

1 14. The apparatus of claim 13 further comprising a central member, the
2 arms being movably coupled to the central member.

1 15. The apparatus of claim 14 wherein the arms are configured to clamp
2 the leaflets between the arms and the central member in the closed position.

1 16. The apparatus of claim 14 wherein the central member is configured to
2 be positioned through the valve between the leaflets.

1 17. The apparatus of claim 14 wherein the central member is detachably
2 coupled to a shaft adapted for delivering the arms into the heart.

1 18. The apparatus of claim 17 further comprising a pair of superior
2 elements movably coupled to the shaft, the superior elements being configured to engage the
3 superior surfaces whereby the leaflets may be pinched between the arms and the superior
4 elements.

- 1 19. The apparatus of claim 18 wherein the superior elements are coupled
2 to a conduit slidably coupled to the shaft.
- 1 20. The apparatus of claim 18 wherein the superior elements are resiliently
2 biased into an extended configuration in which portions of the superior elements are spaced
3 apart from the shaft for engaging the superior surfaces of the leaflets.
- 1 21. The apparatus of claim 13 wherein the arms have engaging surfaces for
2 engaging the inferior surfaces of the leaflets without penetration thereof.
- 1 22. The apparatus of claim 21 wherein the engaging surfaces have a
2 texture or teeth for enhancing friction.
- 1 23. The apparatus of claim 17 wherein the shaft is flexible and configured
2 for positioning through a blood vessel into the heart.
- 1 24. The apparatus of claim 23 wherein the shaft, arms and central member
2 are slidably positionable through an endovascular sheath.
- 1 25. A method of repairing a valve in a patient's body, the valve having a
2 plurality of movable leaflets, the method comprising:
3 positioning a coapting device near the valve, the coapting device having a
4 grasping element;
5 atraumatically grasping the leaflets with the grasping element to at least
6 partially immobilize the leaflets relative to each other; and
7 implanting the coapting device in the patient's body, wherein the leaflets are
8 not penetrated by the coapting device.
- 1 26. The method of claim 25 wherein the grasping element has a pair of
2 opposing non-penetrating surfaces for pinching the leaflets therebetween.
- 1 27. The method of claim 26 wherein the grasping element has a pair of
2 movable jaws, the non-penetrating surfaces being disposed on the movable jaws.
- 1 28. The method of claim 25 wherein the leaflets have a superior surface on
2 a first side thereof and an inferior surface on an opposing side thereof, and wherein the
3 grasping element atraumatically engages the inferior surfaces of the leaflets.

1 29. The method of claim 28 wherein the coapting device is implanted with
2 at least portions of the superior surfaces of the leaflets generally facing each other.

1 30. The method of claim 28 wherein the grasping element comprises a pair
2 of movable arms, wherein the leaflets are immobilized by engaging the inferior surfaces and
3 pinching the leaflets together with the movable arms.

1 31. The method of claim 30 further comprising atraumatically engaging
2 the superior surfaces of the leaflets with a pair of superior elements.

1 32. The method of claim 25 further comprising applying energy to the
2 leaflets before implanting the coapting device.

1 33. The method of claim 32 wherein the energy is applied to fuse at least
2 portions of the leaflets together.

1 34. The method of claim 25 wherein the valve is in the heart.

1 35. The method of claim 34 wherein the valve is the mitral valve.

1 36. The method of claim 35 wherein positioning the coapting device
2 comprises introducing the coapting device through interatrial septum into the left atrium.

1 37. The method of claim 34 wherein positioning the coapting device
2 comprises endovascularly positioning the coapting device through a blood vessel into the
3 heart.

1 38. Apparatus for repairing a valve in a patient's body, the valve having a
2 plurality of movable leaflets, the apparatus comprising:
3 a delivery device; and
4 a grasping element releasably coupled to the delivery device and configured to
5 atraumatically grasp the leaflets to immobilize at least a portion of the leaflets relative to each
6 other, the grasping element being implantable in the patient's body to hold the leaflets in a
7 coapted configuration without penetrating the leaflets.

1 39. The apparatus of claim 38 wherein the leaflets have a superior surface
2 on a first side thereof and an inferior surface on an opposing side thereof, and the grasping

3 element comprises a pair of arms coupled together and movable from an open position in
4 which portions of the arms are spaced apart to a closed position in which the portions of the
5 arms are closer together, the arms being configured to engage the inferior surfaces of the
6 leaflets and hold the leaflets in a coapted configuration in which portions of the superior
7 surfaces are facing each other.

1 40. The apparatus of claim 39 wherein the grasping element has a pair of
2 superior elements for engaging the superior surfaces of the leaflets.

1 41. The apparatus of claim 38 wherein the grasping element has a pair of
2 opposing non-penetrating surfaces for pinching the leaflets therebetween.

1 42. The apparatus of claim 38 wherein the grasping device has a pair of
2 movable jaws, the non-penetrating surfaces being disposed on the movable jaws.

1 43. The apparatus of claim 37 wherein the delivery device comprises a
2 catheter shaft configured for endovascular positioning through a blood vessel.

1 44. A system for repairing a valve in a patient's body, the valve having a
2 plurality of movable leaflets, the system comprising:
3 a grasping element configured to atraumatically grasp the leaflets to
4 immobilize at least a portion of the leaflets relative to each other; and
5 means for fastening at least a portion of the leaflets together without
6 penetrating the leaflets.

1 45. The system of claim 44 wherein the fastening means comprises a clip.

1 46. The system of claim 44 wherein the fastening means comprises a
2 device for delivering energy to the leaflets.

1 47. The system of claim 46 wherein the energy is selected from
2 radiofrequency, laser, microwave, or ultrasonic energy.

1 48. The system of claim 44 further comprising an endovascular catheter,
2 the grasping element being coupled to the endovascular catheter.

1 49. The system of claim 48 wherein the fastening means is coupled to the
2 endovascular catheter.

1 50. The system of claim 44 wherein the grasping element forms at least
2 part of the fastening means.

1 51. A method of repairing a valve in a patient's body, the valve having a
2 plurality of movable leaflets, the method comprising:
3 atraumatically grasping the leaflets;
4 immobilizing at least a portion of the leaflets relative to each other; and
5 fastening the leaflets together without penetrating the leaflets.

1 52. The method of claim 51 wherein fastening the leaflets comprises
2 applying a clip to the leaflets.

1 53. The method of claim 51 wherein fastening the leaflets comprises
2 delivering energy to the leaflets.

1 54. The method of claim 53 wherein the energy is selected from
2 radiofrequency, laser, microwave, or ultrasonic energy.

1 55. The method of claim 51 wherein the grasping, immobilizing and
2 fastening of the leaflets is performed using endovascular devices.

1 56. The method of claim 51 wherein grasping, immobilizing and fastening
2 of the leaflets is performed using the same device.

1 57. The method of claim 56 wherein the device is implantable.

1 58. The method of claim 51 wherein the valve is in the heart.

1 59. The method of claim 58 wherein the valve is the mitral valve.